

**ANALYSES OF THE CINCHONA BARKS ON EXHIBITION IN THE
MATERIA MEDICA SECTION. U. S. NATIONAL MUSEUM.**

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The collection of cinchona barks now on exhibition in the materia medica section of this museum represents about all the varieties that are to be found in commerce. They were received mostly from the Government plantations of India, Government plantations of Jamaica, Messrs. Howard & Sons, London, Messrs. W. H. Schieffelin & Co., New York, and the U. S. Centennial Exhibition, 1876.

The collection comprises nearly all the natural barks of South America, and almost every variety of the cultivated product from the plantations in India, Java, Ceylon, Mexico, and Jamaica. They number in all over a hundred specimens.

With such a large and varied collection the question naturally arose, what is the comparative value of these barks? To answer this it was simply necessary to assay them, which was accordingly undertaken at the suggestion of the present curator, Dr. H. G. Beyer, U. S. N. (Some specimens existed in such a limited quantity that even the small amount of 5 grams could not be spared, and thus had to be omitted from the list given below.)

Through the courtesy of Prof. F. W. Clarke I was allowed to do the work in the laboratory of the U. S. Geological Survey.

Many of the methods described in the books for determining the amount of cinchona alkaloids were tried, with the view of obtaining one which would give the smoothest results. The following is a description of the method employed:

(1) Five grams of the finely powdered bark are first digested for several hours with 100^{cc} of a 1 per cent. solution of sodium hydrate, filtered, and the contents of the filter washed with an additional 50^{cc} of alkaline solution. (This preliminary operation is to remove tannin, coloring, and other objectionable substances, which greatly interfere with the subsequent removal of alkaloids by chloroform.) This solution is then made acid, filtered from the precipitated cinchona red, the filtrate rendered alkaline, and such alkaloids as may have been dissolved are removed with chloroform, the chloroformic solution evaporated, and the residue weighed. This weight is to be added to the final result.

(2) The bark so prepared is now transferred to a flask, with 100^{cc} of a 2½ per cent. solution of sulphuric acid, and digested for several hours on a water-bath; filter and repeat the operation, washing the filter until the filtrate ceases to become turbid upon the addition of sodium hydrate. (The bark that has so far as possible been exhausted of

alkaloids is still capable of yielding an acid infusion, which is decidedly fluorescent, but does not reveal the presence of alkaloids by the addition of alkali.)

(3) Sodium hydrate is now added to the acid liquor until distinctly alkaline, 15^{cc} chloroform next added, and the contents of the flask thoroughly agitated. After the chloroform has all settled to the bottom, the supernatant liquid is decanted and the chloroformic solution of the alkaloids transferred to a filter wetted with water. The decanted liquid is again treated twice with chloroform, using 10^{cc} each time, and the resulting alkaloidal solutions added to the above filter. As soon as all the aqueous fluid has filtered through, the filter is broken and its contents allowed to filter through a filter wetted with chloroform into a tarred flask; this is placed on a water-bath and the contents evaporated until the flask ceases to lose weight. This weight, plus the weight of the alkaloids obtained from the alkaline washings of No. 1, multiplied by 20, gives the percentage of total alkaloids.

(4) The amount of ether soluble alkaloids is obtained by treating these two residues with 30 times their weight of ether, filtering, evaporating, and multiplying the weight of the residue by 20.

No.	Name.	Locality.	Description.	Ash.	Alkaloids.		Remarks.
					Total.	Ether sol.	
52930	Cinchona anglica.....	Madras	Blackish quills fissured transversely.....	<i>Pr. et.</i> 2.505	<i>Pr. et.</i> 3.934	<i>Pr. et.</i> 2.180	Natural bark.
52931	do.....	do	Curved, warty pieces of a chocolate color.....	1.980	4.818	3.744	Renewed bark.
52932	do.....	do	Thick, dark gray pieces fissured transversely.....	1.980	6.908	4.352	Mossed bark.
51009	Cinchona javanica.....	Java	Thick quills covered with lichens.....	1.700	0.588	0.200	
52000	do.....	do	do.....	1.820	1.668	1.010	
52002	Cinchona Hasskarliana.....	do	Large quills.....	1.720	2.597	0.900	
52007	Cinchona Pahudiana.....	do	Very thin quills.....	1.920	0.578	0.190	
52911	do.....	Madras	Thin quills covered with lichens.....	2.541	0.906	0.905	Natural bark.
52912	do.....	do	Smooth, chocolate-colored quills.....	1.008	0.663		Mossed bark.
52928	Cinchona Pelletierana.....	South America	Large, thick flat pieces.....	1.651	0.755	0.360	
52909	Cinchona Schubkraft.....	Java	Thin quills.....	1.800	1.128	0.180	
53231	Cinchona hybrid.....	Jamaica	Large quills wrinkled longitudinally.....	2.344	4.966	2.770	
53205	do.....	India	Dark quills marked with grayish spots.....	2.340	4.790	3.089	Root bark.
52904	do.....	do	Quills covered with lichens.....	1.910	3.468	2.160	
52930	do.....	Jamaica	Thin, rough quills.....	3.180	4.744	2.752	
52909	Cinchona Pitayensis.....	Madras	Small quills covered with lichens.....	4.565	6.250	0.510	Natural bark.
52916	Cinchona micrantha.....	Venezuela	Thin twisted pieces.....	3.280	4.800	3.360	Do.
51651	Cinchona cordifolia.....	Brazil	Large, thick pieces and thin quills.....	2.081	0.588	0.200	Var. rotundifolia.
51692	Cinchona carabayensis.....	do	Thin quills.....	2.700	0.989	0.250	
50052	Cinchona officinalis.....	Madras	Curved, thick pieces fissured transversely.....	2.220	2.388	2.000	
52015	do.....	do	Very thin quills.....	2.660	1.906	1.520	Var. Crispa.
52800	do.....	Madras	Thin quills, natural bark.....	3.920	2.424	2.040	Var. Urutisinga.
52905	do.....	do	Blackish, curved pieces; mossed bark.....	3.600	1.350	1.000	Do.
52891	do.....	do	do.....	3.540	0.968	0.968	Do.
52809	do.....	do	Dark, brown, warty pieces, renewed bark.....	3.420	4.386	3.080	Do.
52902	do.....	do	Long, black quills, natural bark.....	3.720	3.820	3.446	Do.
52021	do.....	South America	Long, thin, fibrous quills.....	1.800	0.958	0.670	
52932	do.....	Madras	Long, curved pieces.....	1.000	9.122	4.000	
52016	do.....	Java	Gray quills.....	3.020	1.177	0.890	
52005	do.....	Ceylon	Very thin quills.....	2.581	1.306	0.610	
52936	do.....	do	Large quills of very thin bark.....	3.040	1.186	0.806	
52929	do.....	do	Large quills covered with thick knotty rings.....	2.480	2.260	1.005	Knotty bark of Jussieu.
52805	do.....	do	Thin, wrinkled pieces, glossy chocolate color.....	3.320	3.848	3.480	Renewed after shaving.
52929	do.....	Madras	Blackish quills covered with lichens.....	3.540	4.965	4.580	
53218	do.....	India	Quills very much wrinkled.....	2.260	2.260	1.700	
53207	do.....	do	Thick, gray quills.....	3.000	2.983	2.103	
53206	do.....	India	Dark colored quills covered with lichens.....	2.790	2.790	1.280	
52906	do.....	do	Thin, grayish-black quills.....	2.340	3.988	3.000	Mossed bark.
52908	do.....	Madras	Curved pieces.....	2.650	4.560	4.180	Renewed bark.

52907	do	do	Grayish black, wrinkled pieces	3, 600	5, 500	4, 700	Mossed bark.
52897	do	do	Thin curved pieces	2, 060	4, 555	4, 180	Renewed bark.
52898	Cinchona officinalis condaminea	do	Dark brown, curved somewhat warty pieces	2, 380	1, 463	1, 392	
52899	do	do	Curved brown pieces	1, 640	1, 528	1, 140	
52900	do	do	Slender, chocolate-colored pieces	1, 962	3, 620	3, 100	
52901	Cinchona officinalis angustifolia	do	Curved, chocolate-colored with lichen	2, 480	1, 090	0, 710	Natural bark.
52902	do	do	Curved pieces	2, 540	7, 200	6, 000	Renewed bark.
52903	do	do	Curved, wrinkled pieces	3, 760	7, 430	7, 050	Mossed bark.
52904	do	do	Small, wrinkled pieces	2, 900	6, 388	6, 000	Renewed bark.
52940	Cinchona pubescens	do	Curved, warty pieces	2, 270	5, 526	2, 771	Do.
52925	do	do	Small quills covered with lichen	3, 960	4, 280	3, 892	Natural bark.
52926	do	do	Curved, warty pieces	2, 040	4, 388	4, 030	Renewed bark.
52928	do	do	Small quills	* 2, 740	4, 880	4, 430	Natural bark.
52924	do	do	Curved, warty pieces	2, 200	5, 613	5, 230	Renewed bark.
52938	do	do	Twisted quills	3, 020	3, 648	3, 260	Do.
52927	do	do	Small quills	2, 855	4, 127	2, 330	Natural bark.
52930	do	do	Twisted quills fissured transversely	2, 901	6, 548	6, 160	Do.
52931	do	do	Black, curved pieces	2, 780	3, 566	3, 000	Mossed bark.
52929	do	do	Black quills	2, 940	2, 846	2, 300	Do.
52896	do	do	Curved, thick wrinkled pieces	2, 480	3, 080	4, 600	Do.
52914	do	do	Corky bark	3, 560	1, 638	0, 250	Corky bark.
52915	do	do	do	2, 501	1, 857	1, 470	
52928	do	do	Curved, thin pieces fissured longitudinally	2, 400	4, 672	4, 292	
50431	Cinchona succirubra	do	Thin quills	2, 860	4, 448	2, 990	
50731	do	do	Thin, fibrous pieces	4, 640	3, 007	1, 760	Rubingosa bark.
52379	do	Mexico	Dark gray quills and partly covered with lichen	1, 761	2, 708	1, 281	
52013	do	South America	Chocolate-colored quills	2, 926	5, 010	2, 750	
52023	do	do	Thin quills; epidermis easily detached	2, 743	4, 928	2, 594	
52018	do	Madras	Small fibrous pieces	2, 509	5, 180	2, 370	
52012	do	do	Large quills and curved pieces	3, 100	5, 050	3, 500	
52003	do	do	Warty quills	2, 740	3, 248	2, 332	
52001	do	Ceylon	Thick quills	2, 840	4, 129	1, 780	
52030	do	Java	do	2, 400	5, 027	2, 811	
52035	do	Madras	Black quills	4, 081	5, 341	2, 531	
52935	do	do	Thin quills	3, 220	4, 360	2, 020	
52934	do	do	Dark, thin curved pieces	3, 182	4, 466	2, 003	
52932	do	do	Dark, warty curved pieces	2, 560	4, 536	2, 097	
52936	do	do	Curved pieces, very much wrinkled	2, 446	4, 268	1, 930	
52939	do	do	Gray quills	2, 580	5, 888	3, 000	
52933	do	do	Brown, wrinkled pieces	3, 370	9, 240	3, 343	
52937	do	India	Thick quills	2, 070	4, 905	3, 600	
52901	do	do	Large quills	2, 213	4, 130	2, 200	
52900	do	do	Very thin, wrinkled pieces	2, 766	1, 822	1, 520	
52902	do	do	Large quills, brown, thin, wrinkled longitudinally	2, 561	3, 940	1, 402	
52935	do	do	Thin pieces	2, 722	5, 280	3, 000	
52938	do	do	Smooth, gray quills	2, 640	5, 537	2, 470	
52937	do	Jamaica	Thick quills	1, 462	2, 808	2, 420	
52937	do	do	Thick, flat pieces	4, 000	1, 607	0, 710	
50129	Cinchona calisaya	do	Thick, flat pieces, very fibrous	1, 380	4, 501	1, 600	
50077	do	Mexico	Dark brown, curved pieces	1, 380	4, 501	1, 600	
52380	do	do	do	1, 380	4, 501	1, 600	

Analyses of cinchona barks—Continued.

No.	Name.	Locality.	Description.	Ash.	Alkaloids.		Remarks.
					Total.	Ether sol.	
52918	Cinchona callisaya.....	India.....	Thick, curved pieces covered with lichens.....	<i>Pr. ct.</i> 1.982	<i>Pr. ct.</i> 2.199	<i>Pr. ct.</i> 1.810	Var. Josephiana. Var. Ledgeriana.
52919	do.....	do.....	Dark, curved pieces covered with lichens.....	2.160	3.473	1.440	
53639	do.....	do.....	Dark, thin quills.....	2.240	0.240	0.240	
53233	do.....	do.....	Small quills covered with lichens.....	3.000	2.688	1.870	
53203	do.....	do.....	Thin quills.....	2.243	7.227	6.840	
53234	do.....	Jamaica.....	Dark brown quills and pieces.....	7.300	5.248	3.000	
53209	do.....	India.....	Thick quills.....	2.480	6.568	6.192	Do. Do.
52004	do.....	Java.....	Large quills covered with lichens.....	1.980	4.580	4.200	